

MODIS Science Team Member

Semi-Annual Report

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FOCUS ACTIVITIES DURING THE REPORTING PERIOD

The most important activities undertaken during this reporting period are the following:

1. Land surface reflectance code development, testing and delivery.
2. MOD09 - QA activities.
3. MOD09 Validation activities
4. Radiative Transfer modeling.
5. AVHRR/MODIS Middle Infrared surface reflectance
6. MODIS Adaptive Processing System (MODAPS) and PI Processing.
7. MODIS Land 250m processing initiative.

1. Land surface reflectance code development, testing and delivery

- A. Corrections for L2, L2G, L3 surface reflectance code, coming from test results analysis or LDOPE comments on products.
- B. Report of aerosol optical thicknesses retrieved from MOD04 in the validation report produced with the MOD09 coarse resolution product (MOD09CRS)
- C. Summary report of the thermal anomaly (MOD14) was added to the MOD09CRS product
- D. Adaptation of the level 3 reflectance code (PGE21) to handle different input and output resolution (250m,500m).
- E. Work on the orbital aerosol product MOD04L_O used in the atmospheric correction process to report both ocean and land optical depth.

2. MOD09 QA activity

Prototype QA activities were conducted during the different tests. We were successful in using the coarse resolution reflectance product (MOD09CRS) to conduct QA at the SCF.

3. MOD09 Validation activities

We continued to use the AERONET data during this period, both optical thickness as size distribution inverted from almucantar and principal plane measurements. The size distribution could be directly fed into the 6S code to represent the best available aerosol model at the location and test the impact of the aerosol model in the atmospheric correction process.

4. Radiative transfer modeling

The polarization version of 6S has been intensively tested and used in the context of determining the approach for accounting for instrumentation polarization in the atmospheric correction process as well as impact on the correction accuracy. The option for correcting for non-lambertian target as it is presented in the MODIS atmospheric correction ATBD has been implemented in 6S.

5. AVHRR/MODIS Middle infrared surface reflectance

Francois Petitcolin joined our group to work on the derivation of the surface reflectance in the middle infrared from MODIS and to investigate the potential of such surface parameter for fire detection, burn scar monitoring, and regarding aerosols inversion. In this method, reflectance in the middle infrared is derived from day and night images. Night images provide ratio of spectral emissivities in thermal and middle infrared. Using such ratio, ground-emitted component of the middle infrared signal is removed from the measurements, allowing for the retrieval of the reflectivity during day. The first step in the production of surface reflectances is the correction of atmospheric perturbations. In our case, middle and thermal infrared radiances must be corrected for day and night images. This can be done only using radiative transfer code. The MODTRAN code was used to compute atmospheric parameters such as the total atmospheric transmission or the upward and downward atmospheric radiances for various atmospheric profiles and aerosols. Tables of atmospheric parameters were built for many different view, solar and atmospheric conditions. These tables are used to perform fast atmospheric corrections over extended areas and for series of day and night images. In preparation of MODIS data, we were looking for images with similar characteristics. About fifteen months of AVHRR Global Area Coverage data were selected, from March 1997 to May 1998. Day and night images over two extended areas (Europe and the southern part of Africa) were extracted from this database. Atmospheric corrections were performed using the method described above. Images of ratio of emissivity were

produced as well as images of middle infrared reflectivity. These results are currently under analysis.

6. MODIS Adaptive Processing System (MODAPS) / PI Processing

The Land surface reflectance SCF remains actively involved in the PI-led processing activity ranging from making sure that PIs' needs are accurately perceived by the MODAPS development team and by management to participating in the development of the processing system and various phases of testing.

The SCF participated in the monthly PI-Processing meetings where Eric Vermote shared the SCF's experience in processing of global AVHRR and SeaWiFS data and made the case to carry out a continuous production testing in MODAPS involving data distribution to the SCFs and the DAACs.

As more testing was performed in MODAPS, the SCF saw the need to improve the land bands in the synthetic data so as to get a better understanding of the land algorithms performance and accuracy. The SCF personnel worked with SDST on using real SeaWiFS data, improving radiative transfer code implementation, improving cloud and aerosols representation in the data and on introducing noise. These improvements in the synthetic data led to detecting some flaws in data processing codes and allowed to resolve them prior to acquiring real data.

In the course of MODAPS testing and in order to exercise the SCF's QA activity, the SCF requested all the MOD09 coarse resolution products be pushed from MODAPS to the SCF. This activity enabled to test the MODAPS subscription capability and to assure it is operational and ready for real data.

The SCF also participated in all of the weekly MODAPS meetings/teleconferences where problems were discussed to identify solutions and where progress in the new development was tracked.

7. MODIS Land 250m processing initiative

Following the SWAMP recommendation to ensure the production of global MODIS data, our SCF participated in the discussions to identify alternatives to the 0.5X MODAPS original production plan. The solution that was adopted was to take the production of the 250m out of MODAPS. The resources initially dedicated to this production will go towards ensuring a global production of 500m and 1km products. A completely independent system will generate 10% of the 250m land surface reflectance and VI's so as to provide some data for the PI's to evaluate. The production plan calls to implement this scenario for the first year. Our SCF played an important role in the shaping of this proposal and in building the prototype production system.

A. MEETINGS ATTENDED

- MODIS Science Team Meeting, November, 1999.
- MODIS Launch, December, 1999, Santa Barbara.
- Monthly PI Processing Status Meetings, NASA/GSFC.
- Weekly Technical Team Meetings, NASA/GSFC.
- Weekly MODIS L1 Integration Meetings.
- Weekly MODAPS Status Meetings, GSC, Lanham, MD
- Weekly PI Processing Status Meetings (New format), NASA/GSFC.
- Weekly SDDT (Science Data Discipline Team) Meetings.
- Daily MODAPS Testing Status Teleconference (only when in test).
- Weekly MODIS/EDC Teleconference.

B. PUBLICATIONS /PRESENTATIONS

El Saleous N.Z., **Vermote E.F.**, Justice C.O., Townshend J.R., Tucker C.J., Goward S.N., 1999, Improvements in the global biospheric record from the Advanced Very High Resolution Radiometer (AVHRR), International Journal of Remote Sensing, (In Press)

Ouaidrari H. and **E. Vermote**, 1999, Operational Atmospheric Correction of Landsat TM data", Remote Sensing of Environment, Special Issue, In press.

C. GLOSSARY

AERONET	AErosol RObotic NETwork
ARS	Agricultural Research Site
ASD	Analytical Spectral Devices
ATBD	Algorithm Theoretical Basis Document
AVHRR	Advanced Very High Resolution Radiometer
BRDF	Bidirectional Reflectance Distribution Function
CIMEL	CIMEL Electronic is a company based in Paris, France
DAO	Data Assimilation office
EDC	EROS Data Center
ESDIS	EOS Science Data Information System
GRIB	GRI in Binary
GSC	General Science Corporation
GSCF	Goddard Space Flight Center
ID	IDentifier
L1B	Level 1B
L2	Level 2
L3	Level 3
LDOPE	Land Data Operational Production Evaluation
MCST	MODIS Characterization Support Team
MODAPS	MODIS Adaptive Processing System
MODIS	MODerate Imaging Spectro-radiometer
MODLAND	MODIS Land team
MOSS-2	Mission OPS and Science System 2
NCEP	National Centers for Environmental Prediction
OPS	OperationS
PI	Principal Investigator
PCF	Process Configuration File
QA	Quality Assurance

SCF	Science Computing Facility
SDS	Science Data Set
SDST	Science Data Support Team
SDDT	Science Data Discipline Team
SeaWiFS	Sea Wide Field of view Sensor
TESS	Terra End to end Science System test
USDA	United States Department of Agriculture
WILT	Week in the LIfe Test